L2: Entry 3 of 5 File: USPT May 26, 1998

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TITLE: Method and apparatus for authenticating the location of remote users of networked computing systems

Detailed Description Text (49):
In FIG. 1, spread spectrum microwave signals 102 from the GPS satellites 101 which are above the horizon and transmitting (for simplicity, only one satellite is shown in FIG. 1) arrive at client authentication means 140, being sensed by an LSS 103 equipped with a microwave L-band antenna. LSS 103 is located at the remote client site and contains GPS signal sensor and processing circuits (as described in greater detail below) that produce digitized state vector observations 105. The preferred form of the client authentication means 140 has the necessary driver hardware and firmware 106 to format and send digital packets containing the state vector observations through a channel 107 and a communications interface 108, onto a communications channel 109, upon being challenged by the host authentication server 150, such as that illustrated in FIG. 5 to be hereinafter described. At the host authentication server 150, a communications interface 110 transfers the received state vector observation digital packets on channel 111 to the client access control module 112 for signal processing (to be described later) and authentication verification by authentication processor 114 in order to grant or deny the client access to the channel 116 to the host system (not shown). The access control module 112 communicates with the authentication processor 114 on channel 113, receiving the authentication signal on line 115. If authentication is successful, client user data 104 are passed by driver 106 and communications interface 108 onto channel 109, to pass through the access control module 112 and reach the host on channel 116.

Detailed Description Text (50):
In contrast to FIG. 1, FIG. 2 shows a system in which GPS data are captured at two separate locations, making DGPS location processing possible. In FIG. 2, spread spectrum microwave signals 202 and 217 from the GPS satellites 201 which are above the horizon and transmitting (again, for simplicity, only one satellite is shown in FIG. 2) arrive at client authentication means 240 and host authentication server 250, being sensed by LSS 203 and LSS 218, respectively. Each LSS is equipped with a microwave L-band antenna and has GPS signal sensor and processing circuits that produce digitized state vector observations. In its preferred form, LSS 203 has the necessary hardware and firmware 206 to format and send digital packets containing the state vector observations 205 through a channel 207 and a communications interface 208 onto a communications channel 209 upon being challenged by the host authentication server 250, such as that illustrated in FIG. 5 and to be hereinafter described. At the host authentication server 250, a communications interface 210 transfers the received state vector observation digital packets on channel 211 to the client access control module 212 for signal processing (to be described later) and authentication verification by authentication processor 214 in order to grant or deny the client access to the channel 216 to the host system (not shown). The access control module 212 communicates with the authentication processor 214 on channel 213, receiving the authentication signal on line 215. In addition, the host authentication server 250 receives state vector observations via channels 219, 221, and communications interfaces 220, 222 from LSS 218, which is under host control.

Detailed Description Text (57):
In accordance with the present invention, applicants have devised a method and apparatus for developing a location signature of a remote client and testing the authenticity of that signature at a host site by processing the raw state vector observations provided as the location signature. A LSS device in the client authentication means at the remote client location and another at (or associated with) the host authentication server site intercept wideband spread spectrum signals transmitted from a plurality of satellites passing above the horizon. Without using knowledge of the code sequence of the satellites, each LSS device prepares the spread spectrum signals as digitized state vector observation data. Each LSS device proceeds by compressing the wideband GPS signals received from the satellites into a narrow band by a compression ratio of at least 100,000:1, preferably at least 280,000:1, removing any frequency bias with a reference oscillator having a frequency offset value that prevents the baseband from passing into a negative frequency space, forming a narrow analog baseband signal comprised of sine wave superpositions, and then producing an analog-to-digital converted representation of the sine wave superpositions.

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